⌾ WANG ELECTRONIC CALCULATORS

for

BUSINESS
STATISTICS
SCIENCE
ENGINEERING

ARITHMETIC $\times$ X^2

$+$ $\sqrt{x}$

$-$ $\div$ LOGARITHMIC

ELECTRONIC TRANSFER LnX

e^x

+ 1 5 9 . 3 7 2 8 6 4 0

CHANGE SIGN

CLEAR DISPLAY

CLEAR ADDER

RECALL ADDER

ENTER

7 8 9

4 5 6

1 2 3

0
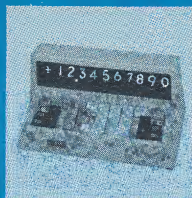
CLEAR ADDER

RECALL ADDER

⌾ WANG

ADVANCED CONCEPTS FOR ELECTRONIC CALCULATORS
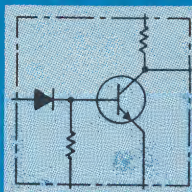
COMPACT:
Keyboard Console measures only 10" X 7½" X 4½" and weighs less than 6 pounds. Can be hand carried from desk to desk.

GREATER CAPABILITY:
Unique design captures logarithmic principle in desk calculators — a breakthrough in product innovation. Each console features two independent add/subtract registers. Duplex operation controls provided to accumulate sums of entries, multipliers and products automatically.

HIGH SPEED:
Electronic circuits insure immediate response — requiring no waiting time for answers to be generated. Memory core gives instant recall of amounts previously registered or processed.

PHANTOM TOUCH:
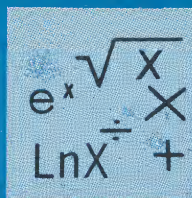Keys actuated by microswitches, providing a confident, secure touch — for speedier, less tiresome operation.

LARGE DIGITS:
Long life display tubes light up with ⅝" high digits in a wide-angle and glare free DISPLAY, providing eye-ease reading of answers.

RELIABILITY:
Motion free integral solid state components provide long lasting and reliable operation without servicing worries; saves maintenance costs, too.
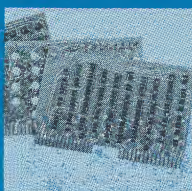
Only the Wang Electronic Calculator gives you all these features for a superior purchase at a most attractive price (see page 6).

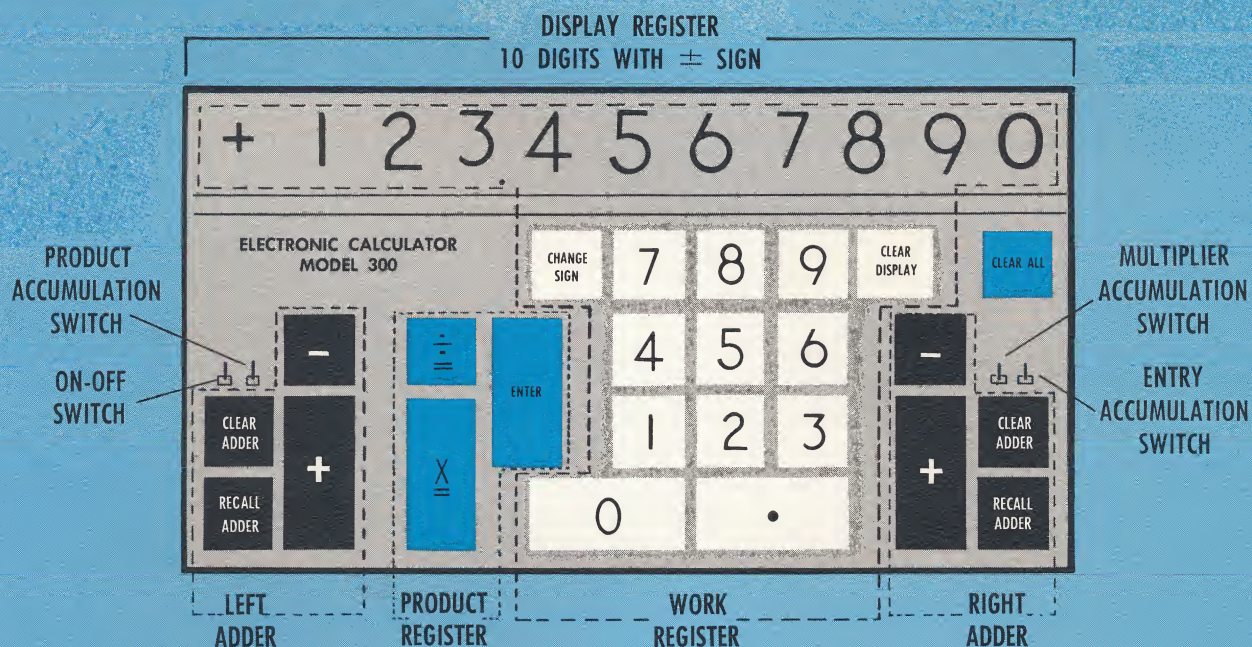**EXAMPLE** □ indicates key strokes

EXAMPLES

1. Addition
12.34 + 103 = 115.34

	KEY STROKE	DISPLAY	LEFT ADDER	RIGHT ADDER	P*
	1 2 · 3 4	+12.34	0	0	1
	+ RA	+12.34	0	12.34	1
	1 0 3	+103	0	12.34	1
	+ RA	+115.34	0	115.34	1

2. Subtraction
27.14 − 33.25 = −6.11

	KEY STROKE	DISPLAY	LEFT ADDER	RIGHT ADDER	P*
	2 7 · 1 4	+27.14	0	0	1
	+ LA	+27.14	27.14	0	1
	3 3 · 2 5	+33.25	27.14	0	1
	− LA	−6.11	−6.11	0	1

3. Multiplication
16.39 x 15 = 245.85

	KEY STROKE	DISPLAY	LEFT ADDER	RIGHT ADDER	P*
	1 6 · 3 9	+16.39	0	0	1
	ENTER	0	0	0	16.39
	1 5	+15	0	0	16.39
	X=	+245.85	0	0	1

4. Division
145 ÷ 12 = 12.0833

	KEY STROKE	DISPLAY	LEFT ADDER	RIGHT ADDER	P*
	1 4 5	+145	0	0	1
	ENTER	0	0	0	145
	1 2	+12	0	0	145
	÷ =	+12.0833	12.0833	0	1

*Product Register

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5. Chain Multiplication

PROBLEM	OPERATION
4.5 x 6.3 x 189 x .43 = 2304.0045	4 · 5 ENTER 6 · 3 ENTER 1 8 9 ENTER · 4 3 X= Record: 2304.0045

6. Invoicing

PROBLEM	OPERATION	
	Turn on Product Accumulator	Clear All
23' @ 2.25 = $ 51.75	2 3 ENTER 2 · 2 5 X=	Record: 51.75
7' @ 14.35 = 100.45	7 ENTER 1 4 · 3 5 X=	Record: 100.45
10' @ 20.08 = 200.80	1 0 ENTER 2 0 · 0 8 X=	Record: 200.80
353.00	RECALL LA	Record: 353.00
Add 3% Sales Tax 10.59	ENTER · 0 3 X=	Record 10.59
363.59	RECALL LA	Record: 363.59

7. Percent Markup on Selling Price

Price	Cost	Margin	%Markup	Operation	
				Turn on Entry Accumulator	Clear All
$1215.75	$705.98	$509.77	41.93%	1 2 1 5 · 7 5 ENTER	
				7 0 5 · 9 8 − RA	Record: 509.77
				÷= ÷=	Record: 41.93 %

8. Summing Reciprocals

$$\frac{1}{1/7 + 1/8 + 1/9} = 2.639$$

OPERATION	
Turn on Product Accumulator	Clear All
7 ÷= 8 ÷= 9 ÷=	
RECALL LA ÷ =	Record: 2.63874 3455

MODEL 300

DISPLAY REGISTER
10 DIGITS WITH ± SIGN

PRODUCT ACCUMULATION SWITCH

ON-OFF SWITCH

MULTIPLIER ACCUMULATION SWITCH

ENTRY ACCUMULATION SWITCH

ELECTRONIC CALCULATOR MODEL 300

+ 1 2 3 4 5 6 7 8 9 0

CHANGE SIGN · 7 8 9 · CLEAR DISPLAY · CLEAR ALL

÷ · ENTER · 4 5 6

× · 1 2 3

0 · .

CLEAR ADDER · RECALL ADDER

CLEAR ADDER · RECALL ADDER

LEFT ADDER · PRODUCT REGISTER · WORK REGISTER · RIGHT ADDER

1. Product Accumulator switch automatically accumulates products in the LEFT ADDER. When the X= or ÷ = key is indexed, the results showing in the Display are automatically added to the LEFT ADDER.
2. Entry Accumulator switch automatically causes the Display figures to be added to the RIGHT ADDER, when the ENTER key is pressed. The addition takes place before the multiplication.
3. Multiplier Accumulator switch automatically causes the figures in the Display to be added to the RIGHT ADDER, when the X= or ÷ = key is pressed, before the multiplication or division takes place.

GENERAL INSTRUCTIONS

1. Plug cord into 115V AC outlet. Use only 3-wire grounded wall outlet. Plug-in cord is attached to the electronic package.

2. The electronic package can be located within 200 feet of the keyboard unit.

3. Turn on the switch located in the upper left hand corner of keyboard to energize the Display.

4. All entries and results will appear in the Display.

5. The "Clear Display" key removes numbers from the Display only.

6. The Calculator has true credit balance and performs all calculations in accordance with the algebraic sign rules.

7. The "Change Sign" key reverses the sign of entries and answers in the Display. The capacity of the Display is 10 digits plus decimal point and sign.

8. The floating decimal point is automatically self-positioned. Enter the decimal point in sequence, as it appears in your formula.

9. Entry errors are cleared by the "Clear Display" key.

10. The "Clear All" key clears the entire machine.

11. Two Adders (left and right hand) operate independently to add, subtract, recall, or clear numbers.

12. Multiplications and divisions are performed in the Product Register,

independent of the right and left Adders. When the Enter key is touched, the number in the Display is multiplied into the Product Register.

NOTE: When the Calculator is cleared, all registers contain zero, except the Product Register, which contains a 1.
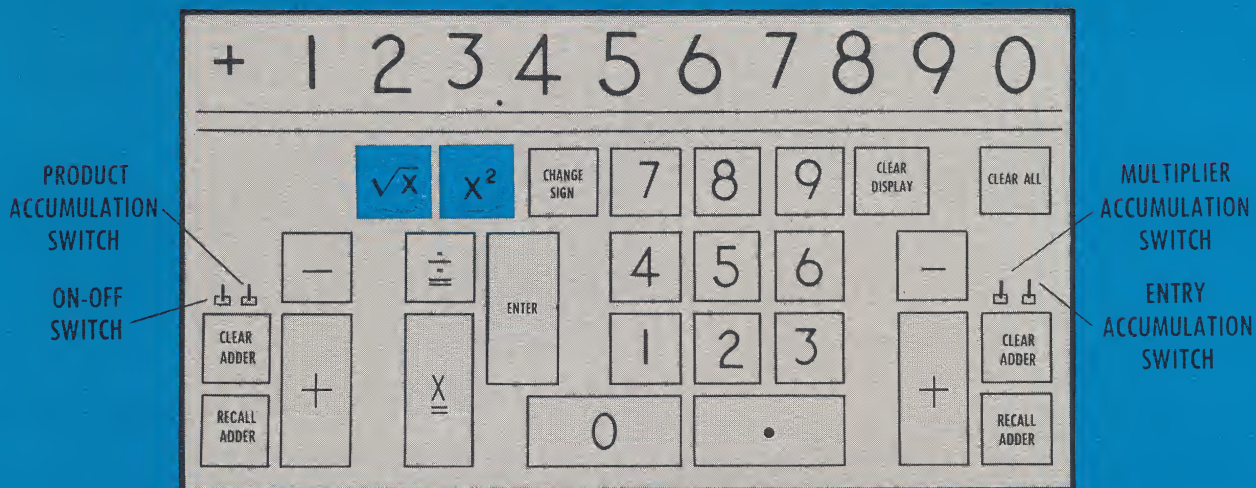
13. To multiply A by B:
   a) Index A
   b) Index ENTER key
   c) Index B
   d) Index X= key
   Read answer in the Display.

14. To divide A by B:
   a) Index A
   b) Index ENTER key
   c) Index B
   d) Index ÷ = key
   Read answer in the Display

STATISTICAL VERSION MODEL 310

1. The Statistical version of Wang Calculators (Model 310) has all the operating advantages of Model 300 plus the feature of finding squares X^2 and square roots $\sqrt{X}$ automatically.

2. After a number has been indexed, the X^2 or $\sqrt{X}$ key automatically squares or takes the square root of the number. The operation occurs in a fraction of a second.

3. The Product Accumulator, used in conjunction with the X^2 or $\sqrt{X}$ key, automatically sums up the squares or square roots of the number in the Left Adder (LA).

4. The Multiplier Accumulator, used in conjunction with the X^2 or $\sqrt{X}$ key, automatically sums up the numbers themselves in the Right Adder (RA).

EXAMPLES

1. To square a number:

   $12^2 = 144$ | 1 | 2 | X² | Read: 144

2. To take a square root:

   $\sqrt{786} = 28.03569154$ | 7 | 8 | 6 | √X | Read: 28.03569154

3. To find Root Mean Square:

   $\sqrt{13^2 + 15^2 + 17^2 + 19^2} = 32.31$

   Turn on Product Accumulator. Clear All

   | 1 | 3 | X² | 1 | 5 | X² | 1 | 7 | X² | 1 | 9 | X² | RECALL LA | √X |

   Read: 32.310988

4. Chain Multiplication with X^2 and $\sqrt{X}$:

   $3.1 \times 4.5^2 \times \sqrt{88} = 588.88$

   | 3 | . | 1 | ENTER | 4 | . | 5 | X² | ENTER | 8 | 8 | √X |

   Read: 588.8816986

5. Standard Deviation

   $$\sigma = \sqrt{\frac{\Sigma X^2}{n} - \left(\frac{\Sigma X}{n}\right)^2}$$ where $\Sigma X^2 = 1020$

   $\qquad n = 5$

   $$= \sqrt{\frac{1020}{5} - \left(\frac{70}{5}\right)^2}$$ $\Sigma X = 70$

   $= 2 \cdot 828427125$

   | 1 | 0 | 2 | 0 | Enter | 5 | ÷ = | + LA |

   | 7 | 0 | Enter | 5 | ÷ = | x² | — LA |

   | √x | Read: 2·828427125

6. Basic Statistical Function

A	A²	B	B²	AB
10	100	3	9	30
12	144	9	81	108
14	196	8	64	112
16	256	24	576	384
18	324	23	529	414
70	1020	67	1259	1048

   Turn on all Duplex Operation Switches (Entry, Multiplier, & Product Accumulation)

   (a) To find A², ΣA and ΣA²:

   CLEAR ALL

   | 1 | 0 | X² | Read: 100
   | 1 | 2 | X² | Read: 144
   | 1 | 4 | X² | Read: 196
   | 1 | 6 | X² | Read: 256
   | 1 | 8 | X² | Read: 324
   | RECALL RA | Read: 70
   | RECALL LA | Read: 1020

   (b) To find B², ΣB and ΣB²:

   CLEAR ALL

   | 3 | X² | Read: 9
   | 9 | X² | Read: 81
   | 8 | X² | Read: 64
   | 2 | 4 | X² | Read: 576
   | 2 | 3 | X² | Read: 529
   | RECALL RA | Read: 67
   | RECALL LA | Read: 1259

   (c) To find AB, ΣAB, and Σ(A + B)

   CLEAR ALL

   | 1 | 0 | ENTER | 3 | X= | Read: 30
   | 1 | 2 | ENTER | 9 | X= | Read: 108
   | 1 | 4 | ENTER | 8 | X= | Read: 112
   | 1 | 6 | ENTER | 2 | 4 | X= | Read: 384
   | 1 | 8 | ENTER | 2 | 3 | X= | Read: 414
   | RECALL RA | Read: 137 (Verifies 70 + 67 = 137)
   | RECALL LA | Read: 1048

SCIENTIFIC VERSION MODEL 320
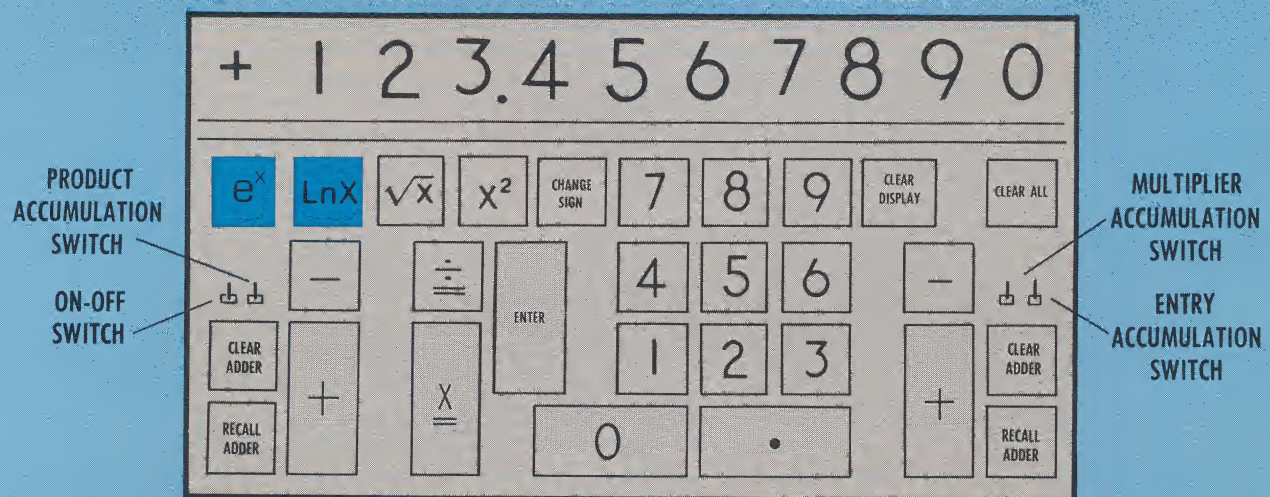
1. The Model 320 Scientific Version of Wang Calculators has all the features of Models 300 and 310. Model 320 has the additional capability of generating the natural log LnX as well as finding the value e^x of a number.

2. Once a number has been indexed on the keyboard, the LnX key or the e^x key may be pressed to generate these respective values automatically in a fraction of a second.

EXAMPLES

1. $3.45^{1.56} = 6.90$

   [3] [.] [4] [5] [LnX] [ENTER] [1] [.] [5] [6] [X=] [e^x] Read: 6.902362884

2. $1.85 (1 - e^{-2.345}) = 1.673$

   [2] [.] [3] [4] [5] [CHANGE SIGN] [e^x] [—] [LA] [1] [+] [LA]
   [ENTER] [1] [.] [8] [5] [X=] Read: 1.672682676

3. A $16,000 mortgage loan is to be paid with interest at .45% per month for 15 years. Find the equal monthly payment.

   $$\frac{Pi}{1-(1+i)^{-n}} = \frac{16,000 \times .0045}{1-(1+.0045)^{-180}} = \$129.89$$

   [1] [+] [LA] [1] [.] [0] [0] [4] [5] [LnX] [ENTER] [1] [8] [0] [CHANGE SIGN] [X=] [e^x] [—] [LA]
   [÷] [ENTER] [1] [6] [0] [0] [0] [ENTER] [.] [0] [0] [4] [5] [X=] Read: 129.8858573

3—D DESIGN * PRINCIPLE

An exclusive design principle in the Wang Calculators gives rise to their unequaled calculating capabilities. By electronic transfer, they operate on additions and subtractions automatically. They also digitally generate the log and the exponent of a number. Thus X, ÷, X² and √X operate as addition, subtraction, doubling and one-half of the log.

The e^x and LnX commands and the fully floating decimal point provide still greater versatility.

These features, forming a 3 — D Design* innovation, are found only in the Wang Electronic Calculators:

+ and —   First Dimension
X, ÷, X² and √X   Second Dimension
LnX and e^x Third Dimension

*Patent pending

GROUP USE OF ELECTRONIC PACKAGE FOR ECONOMY

Up to 4 keyboard consoles can be connected to a single electronic package. Each console may be located 200 feet away from the electronic unit in any direction. This arrangement gives the user of multiple units of Wang Calculators substantial savings in overall cost.

Models of both SIMULTANEOUS and NON-SIMULTANEOUS electronic packages are available. If the electronic package is of the SIMULTANEOUS design, all four keyboard consoles can be used at the same time. If NON-SIMULTANEOUS, the inter-connected keyboard consoles are operative one at a time. The one which is operated first automatically gets the first response from the electronic package.

DOMESTIC U. S. PRICES

	Electronic Unit & One Console	Each Add'l Keyboard Console	Average Price with 4 Consoles
NON-SIMULTANEOUS OPERATION			Approx.
Model 300 Business	$1690	$475	$780
Model 310 Statistical	1895	485	840
Model 320 Scientific	2095	495	900
SIMULTANEOUS OPERATION			
Model 300S Business	$2930	$450	$1100
Model 310S Statistical	3330	460	1200
Model 320S Scientific	3720	470	1300

WHO IS WANG LABORATORIES, INC.?

Wang Laboratories was founded in 1951, among the pioneering concerns making New England the heart of the electronics industry.

Wang's modern plant and engineering facilities are situated just off Interstate Highway 495, known as Boston's new Outerbelt. We are 30 minutes by car from Boston.
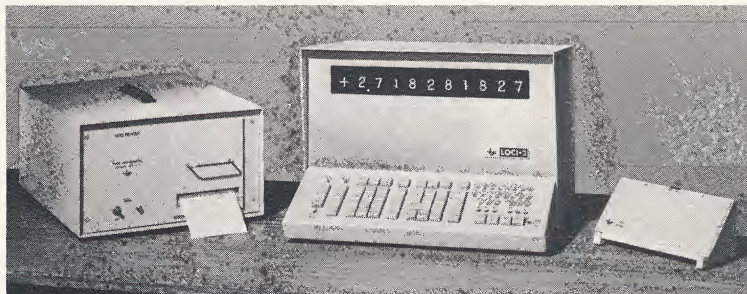
The Wang developed digital systems and electronic products have served a wide range of users in business, industry, the universities and government. We have a standing policy of meeting the needs of our customers first with high grade product design, manufacture, and customer service.

SPECIALIZED APPLICATIONS

The Wang Electronic Calculator can be adapted for "on-line" use as arithmetic processors, with or without programmed calculations, especially where production quantities are involved. You are invited to direct your inquiries to our main office.

LOCI-2 DESK-TOP COMPUTERS

The LOCI-2 (LOgarithmic Computing Instrument), is a Wang electronic desk-top digital computer designed for scientific and engineering computations. It can be programmed for complex routines by means of prescored tab cards. The LOCI-2 has the capability to loop and branch. It also digitally generates the natural logarithm of entries for functions of x, $\div$, x^2, $\sqrt{x}$, $1/x^2$ and $1/\sqrt{x}$. Problems involving exponentials can also be solved.